Answer

Exercise 1

4. (a) $0\cdot1\dot{6}$ (b) $0\cdot\dot{6}\dot{3}$ (c) $3\cdot\dot{2}$ (d) $3\cdot5\dot{3}$ 5. (a) $\frac{2}{9}$ (b) $\frac{35}{99}$ (c) $\frac{2}{15}$ (d) $3\frac{71}{90}$ (e) $6\frac{769}{3330}$ 6 (a) $2\cdot3\dot{3}\dot{3}$, $5\cdot2\dot{3}\dot{5}$ (b) $7\cdot26\dot{6}$, $4\cdot23\dot{7}$ (c) $5\cdot\dot{7}7777\dot{7}$, $8\cdot\dot{3}4343\dot{4}$, $6\cdot\dot{2}4524\dot{5}$ (d) $12\cdot32\dot{0}\dot{0}$, $2\cdot19\dot{9}\dot{9}$, $4\cdot32\dot{5}\dot{6}$ 7. (a) $0\cdot\dot{5}$ (b) $0\cdot58\dot{9}$ (c) $17\cdot117\dot{9}$ (d) $1\cdot92\dot{6}3\dot{1}$ 8.
(a) $1\cdot3\dot{1}$ (b) $1\cdot6\dot{6}\dot{5}$ (c) $3\cdot13\dot{3}\dot{4}$ (d) $6\cdot11\dot{0}6\dot{2}$ 9. (a) $0\cdot2$ (b) 2 (c) $0\cdot\dot{2}07\dot{4}$
(d) $12\cdot1\dot{8}\dot{5}$ 10. (a) $0\cdot5$ (b) $0\cdot2$ (c) $5\cdot\dot{2}195\dot{1}$ (d) $4\cdot\dot{8}$ 11. (a) $3\cdot4641$, $3\cdot464$
(b) $0\cdot5025$, $0\cdot503$ (c) $1\cdot1595$, $1\cdot160$ (d) $2\cdot2650$, $2\cdot265$

12.(a) Rational (b) Rational (c) Irrational (d) Irrational (e) Irrational (f) Irrational (g) Rational ` (h) Rational 13. (a) 9 (b) 5 (c) 8

Exercise 2.1

1. (a) $\{4, 5\}$ (b) $\{\pm3, \pm4, \pm5, \pm6\}$ (c) $\{6, 12, 18, 36\}$ (d) $\{3, 4\}$

2. (a) $\{x \notin N : x$ is odd number and $1 < \times < 13\}$ (c) $\{x \in N : x,$ in the multiple of 36 $\}$
   (c) $\{x \in N : x,$ is the multiple of 4 and $x \leq 40\}$ (d) $\{x \in Z : x^2 \geq 16$ and $x^3 \leq 216\}$

3. (a) $\{1\}$ (L) $\{1, 2, 3, 4, a\}$ (b) $\{2\}$ (c) $\{2, 3, 4, a\}$ (d) $\{2\}$

5. $\{\{x, y), (x), (y\}, \phi\}$, $\{\{m, n, l), (m, n), (m, l\}, \{n, l\}, \{m\}, \{n\}, \{l\}, \phi\}$

7. (a) $2, 3$ (L) (a, c) (b) $(1, 5)$

8. (a) $\{(a, b), (a, c)\}, \{(b, a), (c, a)\}$ (b) $\{(4, x), (4, y), (5, x), (5, y)\}$
   (c) $\{3, 3), (5, 3), (7, 3)\}$

9. $\{1, 3, 5, 7, 9, 15, 35, 45\}$ and $\{1, 5\}$ 10. $\{35, 105\}$ 11. 5 persons

Exercise 2·2

4. $\{(3,2),\ (4,2)\}$ 5. $\{(2,4),\ (2,\ 6)\}$ 6. $-7,\ 23,\ \frac{-7}{16}$ 7. 2 8. 1 or 2 or 3 9. $\frac{4}{x}$

11. (a) $\{2\},\ \{1,\ 2,\ 3\}$ (b) $\{-2,-1,\ 0,\ 1,\ 2),(2,-1)\}$

(c) $\left\{\frac{1}{2},\ 1,\ \frac{5}{2}\right\},\ \{0,\ 1,-1,\ 2,\ -2\}$

12. (a) $\{(-1,2),\ (0,1),\ (1,0),\ (2,-1)\},\ \{-1,\ 0,\ 1,2\},\ \{2,\ 1,\ 0,-1\}$

(b) $\{(-1,-2),\ (0,\ 0),\ (1,\ 2)\},\ \{-1,\ 0,\ 1\},\ \{-2,\ 0,2\}$

13. (a) $\sqrt{41}$ (b) 5 (c) 13

Exercise 3·1

1. (a) $4a^2+12ab+9b^2$ (b) $4a^2b^2+12ab^2c+9b^2c^2$ (c) $x^4+\frac{4x^2}{y^2}+\frac{4}{y^4}$

(d) $a^2+2+\frac{1}{a^2}$ (e) $16y^2-40xy+25x^2$ (f) $a^2b^2-2abc+c^2$

(g) $25x^4-10x^2y+y^2$ (h) $x^2+4y^2+16z^2+4xy+16yz+8zx$

(i) $9p^2+16q^2+25r^2+24pq-40qr-30pr$ (j) $9b^2+25c^2+4a^2-30bc+20ca-12ab$

(k) $a^2x^2+b^2y^2+c^2z^2-2abxy+2bcyz-2cazx$

(l) $a^2+b^2+c^2+d^2-2ab+2ac-2ad-2bc+2bd-2cd$

(m) $4a^2+9x^2+4y^2+25z^2+12ax-8ay-20az-12xy-30xz+20yz$ (n) 10201

(o) 994009 (p) 10140491

2. (a) $16a^2$ (b) $36x^2$ (c) p^2+49r^2-14rp (d) $36n^2-24pn+4p^2$ (e) 100

(f) 4410000 (g) 10 (h) 3104

3. ± 16 4. ± 1 5. $\pm 3m$ 6. 130 8. $\frac{1}{4}$ 11. 19 12. 25 13. 6 14. 138

15. 9 17. $(2a+b+c)^2-(b-a-c)^2$ 18. $(x-1)^2-8^2$ 19. $(x+5)^2-1^2$ 20. (*i*) 3

Exercise 3·2

1. (a) $8x^3+60x^2+150x+125$ (b) $8x^6+36x^4y^2+54x^2y^4+27y^6$

   (c) $64a^3-240a^2x^2+300ax^4-125x^6$ (d) $343m^6-294m^4n+84m^2n^2-8n^3$

   (e) 65450827 (P) 994011992

   (f) $8a^3-b^3-27c^3-12a^2b-36a^2c+6ab^2+54ac^2-9b^2c-27bc^2+36abc$

   (g) $8x^3+27y^3+z^3+36x^2y+12x^2z+54xy^2+27y^2z+6xz^2+9yz^2+36xyz$

2. (a) $8a^3$ (b) $64x^3$ (c) $8x^3$ (d) 1 (e) $8(b+c)^3$ (f) $64m^3n^3$ (g) $2(x^3+y^3+z^3)$

   (h) $64x^3$

3. 665 4. 54 5. 8 6. 42880 7. 1728 10. (a) 3 (b) 9 11. (a) 133

   (b) 665

12. a^3-3a 13. p^3+3p 13. $46\sqrt{5}$

Exercise 3·3

1. $(a+b)(a+c)$
2. $(b+1)(a-1)$
3. $2(x-y)(x+y+z)$
4. $b(x-y)(a-c)$
5. $(3x+4)^2$
6. $(a^2+5a-1)(a^2-5a-1)$
7. $(x^2+2xy-y^2)(x^2-2xy-y^2)$
8. $(ax+by+ay-by)(ax+bx-ay+bx)$
9. $(2a-3b+2c)(2a-3b-2c)$
10. $9(x+a)(x-a)(x+2a)(x-2a)$
11. $(a+y+2)(a-y+4)$
12. $(4x-5y)(4x+5y-2z)$
13. $(a+b+c)(b+c-a)(c+a-b)(a+b-c)$
14. $(x+4)(x+9)$
15. $(x+2)(x-2)(x^2+5)$
16. $(a-18)(a-12)$
17. $(x^3y^3-3)(x^3y^3+2)$
18. $(a^4-2)(a^4+1)$
19. $(ab+7)(ab-15)$
20. $(x+13)(x-15)$
21. $(x+2)(x-2)(2x+3)(2x-3)$
22. $(2x-5)(6x-4)$
23. $y^2(x+1)(9x-14)$
24. $(x+3)(x-3)(4x^2+9)$

25. $(x+a)(ax+1)$

26. $(a^2+2a-4)(3a^2+6a-10)$

27. $(2z-3x-5)(10x+7z+3)$

28. $-(3a+17b)(9a+7b)$

29. $(x+ay+y)(ax-x+y)$

30. $3x(2x-1)(4x^2+2x+1)$

31. $(a+b)^2(a^4-2a^3b+6a^2b^2-2ab^3+b^4)$

32. $(x+2)(x^2+x+1)$

33. $(a-3)(a^2-3a+3)$

34. $(a-b)(2a^2+5ab+8b^2)$

35. $(2x-3)(4x^2+12x+21)$

36. $\frac{1}{27}(6a+b)(36a^2-6ab+b^2)$

37. $\frac{1}{8}(2a-1)(4a^2+2a+1)$

38. $\left(\frac{a^2}{3}-b^2\right)\left(\frac{a^4}{9}+\frac{a^2b^2}{3}+b^4\right)$

39. $\left(2a-\frac{1}{2a}\right)\left(2a-\frac{1}{2a}+2\right)$

40. $(a+4)(19a^2-13a+7)$

41. $(x+6)(x-10)$

42. $(x^2+7x+4)(x^2+7x-18)$

43. $(x^2-8x+20)(x^2-8x+2)$

Exercise 3·4

1. $(6x-1)(x-1)$

2. $(a+1)(3a^2-3a+5)$

3. $(x+y)(x-3y)(x+2y)$

4. $(x-6)(x+1)$

5. $(2x-3)(x+1)$

6. $(x-3)(3x+2)$

7. $(x-2)(x+1)(x+3)$

8. $(x-1)(x+2)(x+3)$

9. $(a+3)(a^2-3a+12)$

10. $(a-1)(a-1)(a^2+2a+3)$

11. $(a+1)(a-4)(a+2)$

12. $(x-2)(x^2-x+2)$

13. $(a-b)(a^2-6ab+b^2)$

14. $(x-3)(x^2+3x+8)$

15. $(x+y)(x+3y)(x+2y)$

16. $(x-2)(2x+1)(x^2+1)$

17. $(2x-1)(x+1)(x+2)(2x+1)$

18. $x(x-1)(x^2+x+1)(x^2-x+1)$

19. $(4x-1)(x^2-x+1)$

20. $(2x+1)(3x+2)(3x-1)$

Exercise 3·5

1. (c) 2. (d) 3. (b) 4. (b)
5. (d) 6. (c) 7. (d) 8. (d)
9. (a) 10. (c) 11. (d) 12. (b)
13. (a) 14. (b) 15. (c) 16. (b)
17. (a) 18. (b) 19. (c) 20. (d)
21. (2) (b) 21. (3) (d) 22. $\frac{2}{3}(p+r)$ days 23. 5 hours

24. $\frac{xy}{x+y}$ days 25. 95 persons

26. Speed of current is $\frac{d}{2}\left(\frac{1}{q}-\frac{1}{p}\right)$ km per hour and speed of boat is $\frac{d}{2}\left(\frac{1}{p}+\frac{1}{q}\right)$ km. per hour.

27. The speed of the oar is 8 km/hour and the speed of current is 2 km/hour

28 $\frac{t_1t_2}{t_2-t_1}$ minutes 29. 240 liter 30. Tk. 10 31. Tk. 48 32. (a) Tk. 120, (b) Tk. 80, (c) Tk. 60 33. Purchase value Tk. 450 34. 4% 35. Tk. 625 36. Tk. 5%

37. Tk. $522\cdot37$ (approx.) 38. Tk. 780 39. Tk. 61

40. VAT is Tk. $\frac{px}{100+x}$; the amount of VAT is Tk. 300.

Exercise 4·1

1. $\frac{10}{7}$ 2. $\frac{ab}{3a+2b}$ 3. 27 4. $\frac{a^2}{b}$ 5. 343 6. 1

7. 4 8. $\frac{1}{9}$ 17. $\frac{3}{2}$ 18. 3 19. 5 20. $0, 1$

Exercise 4·2

1. (a) 4 (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (c) 4 (e) $\frac{5}{6}$

2. (a) 125 (b) 5 (c) 4

4. (a) $\ell og\,2$ (b) $\frac{13}{15}$ (c) 0

Exercise 4·3

1. b 2. d 3. c 4. a 5. c 7. d 8. (1) d (2) c (3) a

9. (a) $6\cdot530\times10^{3}$ (b) $6\cdot0831\times10^{3}$ (c) $2\cdot45\times10^{-4}$ (d) $3\cdot75\times10^{7}$
(e) $1\cdot4\times10^{-7}$

10. (a) 100000 (b) $0\cdot000001$ (c) 25300 (d) $0\cdot009813$ (e) $0\cdot0000312$

11. (a) 3 (b) 1 (c) 0 (d) $\overline{2}$ (e) $\overline{5}$

12. (a) characteristics 1, Mantissa $\cdot43136$ (b) characteristics 1, Mantissa $\cdot80035$
(c) characteristics 0, Mantissa $\cdot14765$ (d) characteristics $\overline{2}$, Mantissa $\cdot65896$
(e) characteristics $\overline{4}$, Mantissa $\cdot82802$

13. (a) $1\cdot66706$ (b) $\overline{1}\cdot64562$ (c) $0\cdot81358$ (d) $\overline{3}\cdot78888$

14. (a) $0\cdot95424$ (b) $1\cdot44710$ (c) $1\cdot62325$

15. a.2 $a^{3}\cdot5^{3}$ b. $6\cdot25\times10$ c. characteristics 1, Mantissa $\cdot79588$

Exercise 5·1

1. 1 2. ab 3. -6 4. -1 5. $-\frac{3}{5}$ 6. $-\frac{5}{2}$

7. $\frac{a+b}{2}$ 8. $a+b$

9. $\frac{a+b}{2}$ 10. $\sqrt{3}$ 11. $\{2\}$ 12. $\{4(1+\sqrt{2})\}$

13. $\{-a\}$ 14. ϕ

15. $\left\{-\frac{1}{3}\right\}$ 16. $\left\{\frac{m+n}{2}\right\}$ 17. $\left\{-\frac{7}{2}\right\}$ 18. $\{6\}$ 19. $\left\{(a^{2}+b^{2}+c^{2})\right\}$

20. 28, 70 21. $\frac{3}{4}$ 22. 72 23. 72 24. 18 25. 9

26. Number of coin of twenty five and fifty paisa are 100 and 20 respectively.
22. 120 km.

Exercise 5·2

1. c 2. b 3. b 4. c 5 d 6. b 7. a 8. (1) d (2) c (3) a

9. $-2,\ \sqrt{3}$ 10. $-\frac{3\sqrt{2}}{2},\ \frac{2\sqrt{3}}{3}$ 11. $-1,\ 6$ 12. ± 7 13. $-6,\ \frac{3}{2}$

14. $1,\ -\frac{3}{20}$

15. $\frac{1}{2},\ 2$ 16. $0,\ \frac{2}{3}$ 17. $\pm\sqrt{ab}$ 18. $0,\ a+b$ 19. $\left\{3,\ -\frac{1}{2}\right\}$

20. $\left\{-\frac{2}{3},\ 2\right\}$

21. $\{-a,\ -b\}$ 22. $\{1,\ -1\}$ 23. $\{1\}$ 24. $\{0,\ 2a\}$ 25. $\left\{\frac{1}{3},\ 1\right\}$ 26. 78 or 87 27. Length 16 metre, breadth 12 metre 28. 9 cm., 12 cm. 29. 27 cm.

30. 21 persons, Tk. 20 31. 70 32. a. $70-9x,\ \ 9x+7$ b. 34 c. 5 cm. $5\sqrt{2}$ cm.
33. b. 5 cm.. c. $2:5:8$

Exercise 9.1

2. $\cos A=\frac{\sqrt{7}}{4}, \tan A=\frac{3}{\sqrt{7}}, \cot A=\frac{\sqrt{7}}{3}, \sec A=\frac{4}{\sqrt{7}}, \operatorname{cosec} A=\frac{4}{3}$

3. $\sin A=\frac{15}{17}, \cos A=\frac{8}{17}$

4. $\sin\theta=\frac{5}{13}, \cos n\theta=\frac{12}{13}, \tan\theta=\frac{5}{12}$

22. $\frac{1}{2}$ 23. $\frac{3}{4}$ 24. $\frac{4}{3}$ 25. $\frac{a^2\cdot b^2}{a^2+b^2}$

Exercise 9.2

5. $\frac{1}{2}$ 6. $\frac{3}{4\sqrt{2}}$ 7. $\frac{23}{5}$ 8. $\frac{2\sqrt{2}}{3}$ 17. $A = 30^\circ, B = 30^\circ$ 18. $A = 30^\circ$

19. $A = 37\frac{1}{2}^\circ, B = 7\frac{1}{2}^\circ$ 21. $\theta = 90^\circ$ 22. $\theta = 60^\circ$ 23. $\theta = 60^\circ$ 24. $\theta = 45^\circ$ 25. 3

Exercise 10

7. 45.033 metre (app.) 8. 34.641 metre (app.) 9. 12.728 metre (app.)

10. 10 metres

11. 21.651 metre (app.) 12. 141.962 metre(app.) 13. 83.138 metre (app.) and 48 metre

14. 34.298 metre (app.) 15. 44.785 metre (app.) 16. (b) 259.808 metre.

Exercise 11·1

1. $a^2 : b^2$, 2. $\sqrt{\pi} : 2$, 3. 45, 60, 4. 20%, 5. 18 : 25, 6. 13 : 7, 8. (i) $\frac{3}{4}$, (ii) $\frac{2ab}{b^2+1}$, (iii) $x = \pm\sqrt{2ab - b^2}$, (iv) 10, (v) $\frac{b}{2a}\left(c + \frac{1}{c}\right)$, (vi) $\frac{1}{2}$, 2, 22. 3

Exercise 11·2

1. a 2. c 3. c 4. b 5. b 6. 24%, 7. 70%, 8. 70%, 9. a Tk. 40, b Tk.60, c Tk. 120, d Tk. 80, 10. 200, 240, 250, 11. 9 cm. 15cm., 21cm., 12. Tk. 315, Tk. 336, Tk. 360, 13. 140, 14. 81 runs 54 runs, 36 runs, 15. Officer Tk. 24000, Clark Tk. 12000 bearer Tk. 6000 16. 70, 17. 44%, 18. 1% 19. 532 quintal, 20. 8 : 9, 21. 1440 sq.metre, 22. 13 : 12.

Exercise 12.1

1. Consistent, not dependent, single solution 2. Consistent, dependent, innumerable solution 3. inconsistent not dependent, has no solution 4. consistent, dependent, innumerable solution 5. consistent, not dependent,

single solution 6. inconsistent, not dependent, has no solution 7. Consistent, dependent, innumerable solution 8. Consistent, dependent, innumerable solution 9. Consistent, dependent, single solution 10. Consistent, not dependent, single solution .

Exercise 12.2

1. (4, -1) 2. $(\frac{6}{5}, \frac{6}{5})$ 3. (a, b) 4. (4, -1) 5. (1, 2) 6. $\left(\frac{a(b-c)}{a(b-a)}, \frac{c(c-a)}{b(b-a)}\right)$
7. $(-\frac{17}{2}, 4)$ 8. (2, 3) 9. (3, 2) 10. $(\frac{5}{2}, -\frac{22}{3})$ 11. (1, 2) 12. (2, -1) 13. (a, b)
14. (2, 4) 15. (4, 5)

Exercise 12.3

1. (2, 2) 2. (2, 3) 3. (-7, 3) 4. (4, 5) 5. (2, 3) 6. (1.5, 1.5) 7. $(1, \frac{1}{2})$ 8. (2, 6)
9. -2 10. 2

Exercise 12.4

1. a 2. c 3. b 4. b 5. b 6. b 7(1) . c 7(2). d
7(3) d 8. $\frac{7}{9}$ 9. $\frac{15}{26}$ 10. 27 11. 37 or 73 12. 30 years 13. length 17 m. breadth 9 metre 14. spread of boat 10 km. per hour, spead of corrent 5 km. per hour 15. starting salary Tk. 4000, yearly increment Tk. 25
16. a. one b. (4, 6) c. sq.unit 17. a. $\frac{x+7}{y} = 2$, $\frac{x}{y-2} = 1$, b. (3, 5), $\frac{3}{5}$

Exercise 13.1

1. -7 Ges -75, 2. 129 Zg, 3. 100 Zg, 4. $p^2 + pq + q^2$, 5. 0, 6. n^2, 7. 360, 8. 320,
9. 42 , 10. 1771, 11. 620, 12. 18, 13. 50, 14. $2+4+6+........$, 15. 110, 16. 0,
17. $-(m+n)$, 20. 50.

Exercise 13.2

5. $\frac{1}{2}$, 2. 3 6. $(3^{14}-1)$, 7. 9^{th} term, 8. $\frac{1}{\sqrt{3}}$, 9. 9^{th} term, 10. $x = 15$, $y = 45$,

11. $x=9,\ y=27,\ z=81$, 12. 86, 13. 1, 14. $55\log 2$, 15. $650\log 2$, 16. $n=7$, 17. 0, 18. $n=6,\ S=21$, 19 $n=5,\ S=165$, 20. $\frac{3069}{512}$, 21. 20, 22. 24.47mm (app.)

Exercise 16·1

1. 20 m., 15 m. 2. 12 m. 3. 12 sq. m. 4. 327·26 sq. m. (app.) 5. 5 m.
6. 30^o 7. 36 or 12 cm. 8. 12 or 16 m. 9 44·44 km. (app.)
10. 24·249 cm. (app.) 254·611 sq. cm. (app.)

Exercise 16·2

1. 9 m. 2. 1056 sq. m. 3. 30 m. and 20 m. 4. 400 m.
5. 6400 6. 16 m. and 10 m. 7. 16·5 m. and 22 m. 8. 35·35 m. (app.)
9 48·66 cm. (app.) 10. 72 cm., 194 sq. cm. 11. 17 cm. and 9 cm.
12. 9·75 sq. cm. (app.) 13. 6·36 sq. m. (app.)

Exercise 16.3

1. 32·97 cm. (app.) 2. 31·513 m. (app.) 3. 20·008 (app.) 4. 128·282 sq. cm. (app.) 5. 7·003 m. (app.) 6. 175·9 m. (app.) 7. 20 times
8. 49·517 m. (app.) 9 $3\sqrt{3}:\pi$

Exercise 16·4

8. 636 sq. m., 20·5 m., 864 cubic metre. 9 14040 sq. m. 10. 12 m., 4 m.
11. 1 cm. 12. 300000 13. 34·641 sq. cm. 14. 534·071 sq. cm. (app.)
942·48 cubic cm. (app.) 15. 5·305 sq. cm. 3 cm.. 16. 6111·8 sq. cm.
17. 147·027 kg. (app.)

Exercise 17

1. (c) 2. (b) 3. (b) 4. (d) 5. (c) 6. (a) 7. (a) 8. (b) 9(c)
10. (c) 11. (c) 12. (c) 13. (c) 14. (b) 15. (b) 16. (a) 20. Median 60 21. (a)62 kg, (b)62.8 kg